scholastic year 1892-93. Though the record cannot be regarded as the best criterion of efficiency, owing to the fact that many of the scholarships are confined to certain schools, and that their values vary considerably, still an indication is obtained of the attention paid by schools to different subjects. The highest number of science scholarships, four, was obtained by Manchester. Epsom and St. Paul's follow with three each, and then Charterhouse, Dulwich, Shrewsbury, and Tonbridge with two each. In mathematics, Clifton, Tiverton, and Merchant Taylor's each obtained three scholarships. The following schools obtained two: Christ's Hospital, St. Paul's, Bristol, Chester, Leatherhead, Liverpool, Wolverhampton, Liverpool Institute, and Wellingborough.

THE vote ot £6,200,000 for public education in England and Wales which was agreed to on Monday, is the largest that has ever been requested for that purpose. In his speech on the subject, Mr. Acland referred to the suggestion that the Bethnal Green Museum should be handed over to the London County Council, and said that if the Council should desire to have the site and the building on reasonable conditions for educational purposes, the Government would be glad to meet them in a reasonable way.

MR. R. W. STEWART, Assistant Lecturer and Demonstrator in Physics in the University College of North Wales, Bangor, has just been granted the degree of Doctor of Science by the University of London. Mr. Stewart's thesis contained the results of a series of experimental determinations of the thermo-conductivities of iron and copper, made in the Physical Laboratory of the University College of North Wales. The results are embodied in a memoir which was recently communicated to the Royal Society by the President (Lord Kelvin), and which has been accepted for publication by the Council of the Society.

THE *British Medical Journal* says that several changes have recently taken place in the teaching staff of St. Bartholomew's Medical School. Among them we note that Dr. F. D. Chattaway has been elected to the Demonstratorship of Chemistry; and Mr. Alfred Howard has been appointed to the Assistant Demonstratorship. Mr. J. S. Edkins, at present George Henry Lewis student, and late Senior Demonstrator of Physiology at Owens College, Manchester, has been elected Demonstrator of Physiology.

Mr. D. T. MACDOUGAL has been appointed Instructor in Vegetable Physiology at the University of Minnesota.

SCIENTIFIC SERIALS.

The Quarterly Journal of Microscopical Science, for July, 1893, contains:—On the morphology and physiology of the brain and sense-organs of Limulus, by Dr. W. Patten (Plates 1 to 5). Some two years ago the author published a paper in the *Quarterly Journal of Microscopical Science* calling attention to many striking resemblances between Arachnids and Vertebrates, and maintaining that the latter are descended from a great group of the former, in which he included the Arachnids, Trilobites, and Merostomata. Attention was called to the evidences of relationship as shown in the invaginations which in insects give rise to the optic ganglia, and in scorpions and Limulus become so extensive as to enfold not only the optic ganglia but the eyes and the forebrain as well. A cerebral vesicle is thus formed, from the floor of which arise the forebrain and the optic ganglia, and from the roof a tubular outgrowth, at the end of which lie the inverted retinas of the parietal eye. Such a condition is to be found only in Arachnids and Vertebrates, and the author thinks it affords as trustworthy evidence of relationship as the presence of a notochord or of gill-slits. Other relationships were indicated between the lateral eyes in Limulus and Vertebrates, between the cartilaginous endocranium in Arachnids, and the primordial cranium of Vertebrates, between the subneural rod in scorpions and the notochord, and in the correspondence between the neuromeres and nerves in Arachnids and Vertebrates. To this long array of evidence the author now adds others: identifying nearly all the important lobes and cavities characteristic of the Vertebrate forebrain in the forebrain of Limulus; showing that the coxal sense-organs are gustatory, and correspond to the supra-branchial sense-organs of Vertebrates, and describing a remarkable organ in Limulus, which has all the characteristic morphological features of the olfactory organs in Vertebrates. The author believes that it may now be regarded as beyond any reasonable doubt that the Vertebrates are descended from the Arachnids. The very interesting palæontological aspect of the subject is promised in a separate memoir.—On the structure of the pharyngeal bars of Amphioxus, by Dr. W. Blaxland Benham (Plates 6 and 7), gives a detailed account of the tongue (or secondary) bar in Amphioxus, and institutes a comparison between it and the primary bar, and there is a *résumé* of the observations of recent observers and an account of certain abnormal bars.—On the perivisceral cavity in Ciona, by A. H. L. Newstead, B.A. (Plate 8). The author found (1), that there are no communications between the perivisceral cavity and the atrial cavity (such as were described by Kupffer, though denied by Roule); (2) that definite communications exist between the perivisceral cavity and the pharynx, and as these openings occur in the same position as the orifices described by Kupffer, it is probable that the supposition of van Beneden and Julen is correct, that the orifices observed by Kupffer open into the perivisceral and not into the atrial cavity. The perivisceral cavity is regarded as a specially modified epicardium, which has become greatly enlarged.—On the early stages in the development of *Distichopora violacea*, with a short essay on the fragmentation of the Nucleus, by Dr. Sydney J. Hickson (Plate 9). In this paper we have first an account of the early stages of the development of *Distichopora violacea* from material collected by the author in North Celebes and by Prof. Haddon in Torres Straits; then an account of the formation of the germinal layers in the Cœlenterata. A sketch of the developmental histories, as known up to the present, is given, with the typical invaginate gastrula at one end and the multinucleated plasmodium at the other; and, lastly, the important question of the "fragmentation" of the Oosperm nucleus is very ably and judiciously discussed, the following conclusions from the evidence adduced being drawn: (1) Fragmentation of the nucleus is a normal method of nuclear division, and is not always a sign of pathological change; (2) in many cases where the nucleus is supposed to disappear, there is, as a matter of fact, only a minute fragmentation; (3) that fragmentation only occurs when there is no cell division; and (4) that karyokinetic division of the nuclei is caused by the forces in the cell protoplasm which bring about the division of the cytoplasm. The phenomena of pluripolar mitosis may afford examples of intermediate types.

Bulletin de l'Académie Royale de Belgique, No 5.—On negative hydrostatic pressure (continued), by G. Van der Mensbrugghe. A test-tube is completely filled with water, and another, with thin walls and a little narrower, is plunged into it to about half the depth. On inverting the two tubes the smaller one rises through the water in the other in spite of gravitation, owing to the suction exerted by the water, whose internal pressure is less than that of the atmosphere. If a tube of paper or of waxed silk be substituted for the smaller test-tube, the flexible tube is flattened when plunged down into the other, but regains its circular section on placing the system upside down. Just as it is possible to subject a large vessel to an enormous internal pressure by ordinary hydrostatic pressure, so it is possible, on the other hand, to subject it to a corresponding external pressure by inverting the hydrostatic tube.—Researches on monocarbon derivatives, by Louis Henry (continued). This contains an account of the mono-chloric, mono-bromic, and mono-iodic oxides of methyl.—Contribution to the study of trichinosis, by Dr. Paul Cerfontaine. A study of some cases of the epidemic of Herstal, near Liege, in January, led to the following conclusions. As soon as the infected meat is introduced into the system, the cysts are destroyed, and the larvæ liberated in the stomach, whence they pass after some time into the intestine. There they grow rapidly, and fecundation takes place in the intestine after the second day of infection. The males are then expelled from the system, and many of the females penetrate the walls of the intestine and even enter the mesentery, where they produce offspring after the sixth day of infection. This penetration of the walls of the intestine gives its peculiarly fatal character to trichinosis. The young entozoa are disseminated throughout the system by the lymphatic vessels, which carry them into the blood. Owing to their small size they penetrate into the capillaries, and produce congestion of the blood-vessels and œdema. Death is often due to what amounts

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to a maceration of the respiratory muscles, producing asphyxia

Wiedemann's Annalen der Physik und Chemie, No. 7.—On the specific heats of glasses of various compositions, by A. Winkelmann. The specific heats of the various constituents of different glasses were calculated or experimentally determined, and those of the glasses made up of them were calculated by Wöstyn's law, according to which a specific heat of a compound is obtained by adding together the products of the specific heats, the atomic weights, and the number of atoms of the elements contained in the compound, and dividing by the sum of the products of the atomic weights and numbers of atoms. On comparing the values thus calculated with those found by experiment, it was found that they agreed to within one per cent.—On a surface connected with the electric properties of tourmaline; thermodynamics of tourmaline and the mechanical theory of muscular contraction; and molecular theory of piezo-electric and pyro-electric phenomena, by E. Riecke. The author makes the attempt of formulating a thermodynamical theory of muscular contraction, and investigates its connection with the pyroelectric phenomena of tourmaline. He arrives at a formula in which the state of the muscle can be expressed by two variables only, the temperature and the tension.—Concerning the theory of electric oscillations in wires, by A. Elsas. The author shows that the Hertzian oscillations may be completely explained on the older electromagnetic theory, without reference to Maxwell's amplifications. He does not contend that Maxwell's theory is superfluous, but finds out how far the older theory is capable of proceeding without having recourse to Maxwell's conceptions.—Objective representation of Hertz's experiments, and the high tension accumulator, by L. Zehnder. A collection of practical hints for the performance of oscillation experiments by means of the 600-cell Planté accumulator.—Contributions to the theory of secondary batteries, by Franz Streintz. With comparatively low current densities, the resistance during discharge attains a maximum. As the current increases, the resistance slowly falls to a value equal to that in open circuit, and falls still further at higher current strengths.—On the determination of the length of a solenoid, by F. Himstedt. Contrary to Heydweiler's opinion, the length and radius of a solenoid as determined by its electromagnetic effect are not appreciably different from their geometrically calculated values.

In the *Botanical Gazette* for June Mr. R. H. True has a paper on the development of the caryopsis, which supports the ordinary view respecting the formation of the fruit in grasses. Prof. Atkinson continues his account of the biology of the organism which causes the tubercles on the roots of Leguminosæ.

In the *Journal of Botany* for July, Mr. A. B. Rendle describes and figures a case of the production of tubers within a tuber in the potato. Yet two more "species" are added to the long list of British *Hieracia* by Messrs. E. F. and W. R. Linton, *H. enstales* and *orcadense.*

In the *Nuovo Giornale Botanico Italiano* for July is a paper by Sig. E. Baroni on the anomalous genus *Rohdea*, which he prefers to place in the order Liliaceæ and tribe Asparageæ, rather than in the Araceæ. The minute structure of *Rohdea japonica* is described, and the mode of pollination, which appears to be effected partly by insects, but largely by snails, and even by spiders.

The *Bulletino della Società Botanica Italiana*, Nos. 5–7, are largely occupied by papers chiefly interesting to Italian botanists. In addition, Sig. A. Baldacci has some observations on the sympodial branching in *Symphytum* and in other Borragineæ, and on the mode of branching in the Apocynaceæ, which appears to be also sympodial. Sig. U. Brizi enumerates the fossil Musci and Hepaticæ found in a locality within the Roman territory. Sig. C. Acqua describes the mode of formation of the wall in the growth of the pollen-tube of *Vinca major*, which presents a strong resemblance to that described by Buscalioni in the aerial hairs of *Lavatera.* Sig. C. Massalongo has several papers on galls.

SOCIETIES AND ACADEMIES.

London.

Royal Society, June 1.—"On the Colours of Sky Light, Sun Light, Cloud Light and Candle Light." By Captain W. de W. Abney, C.B., D.C.L., F.R.S., P.R.A.S.

The author has made several comparisons of the above lights throughout the different parts of their spectra, and has been able to verify their correctness by means of templates rotating in the spectrum of electric light, as described in Part II., "Colour Photometry," Phil. Trans., 1889. It seemed, however, that it would be useful if the colours of these lights could be expressed in single wave-lengths, together with the amount of added standard white light, the latter being expressed in terms of the luminosity of the dominant colour, in accordance with the method brought before the Royal Society in Proc. Roy. Soc., 1891.

When measuring light from the sky, a beam from the zenith or other desired part was reflected through a blackened tube into a darkened room in which the colour patch apparatus ("Colour Photometry," Abney and Festing, 1886) was placed, and the image of the end of the tube was focussed on to the front surface of a cube, the front surface of which was coated with zinc white, its background being black velvet. The patch of colour from the apparatus was also thrown on the cube. A rod placed in the paths of the two beams enabled the sky light and the spectrum colour to be examined side by side. The slit in the spectrum was an adjustable one so that any intensity of colour within limits would fall on the cube. A beam of white light reflected from the first surface of the first prism was again reflected from the surface of a thin prism on to the cube, a rod placed in its path cast a shadow on that part illuminated by the sky light, and by suitable adjustment the boundaries of the two shadows were caused to exactly coincide. The colour was thus diluted with white light, and rotating sectors, described in other papers, being placed in the path of the white beam, enabled the dilution to be regulated.

Sky Light.—On June 27, 1892, at 2.30 p.m., the sky was a good blue, but not a dark blue, and perhaps rather milky. The slit was moved into the part of the spectrum which appeared to be near the dominant colour. The colour was diluted to approximately the required amount. The slit was shifted and the dilution altered until the two colours made a perfect match. It was found that on the standard scale of the spectrum the dominant colour was represented by 28·6, which is λ 4800. The mean value of the sector aperture was 32°, and recollecting that the sectors are double sectors the comparison has to be made with 180°. The next operation was to compare the luminosity of the whole beam of white light with that of the colour. The sectors still remained in the white; the sky light was cut off, and the rod altered till the colour and the white were alongside each other with the boundaries of the shadows touching. The luminosities of the two were compared, and it was found that the aperture of the sector was 14°. As it required 32° of white to make the dilution of the colour, it follows that 32/14, or 2·286, parts of white were required to dilute 1 part of the blue. This may be expressed thus—

$$\text{Sky light} = \lambda\ 4800 + 2{\cdot}3\text{W}.$$

On July 4, 1892, at mid-day, the same procedure was adopted, and the dominant wave length was again λ 4800. In this case the amount of added white was thus—

$$\text{Sky light} = \lambda\ 4800 + 3{\cdot}1\text{W};$$

in other words, the sky was more milky.

At 4 p.m. on the same day the sky to the east, and about 30° above the horizon, was evidently slightly greener, and it was found that the colour agreed with scale No. 29·6 or λ 4834, and that it required three parts of white to be mixed with it.

$$\text{Sky light} = \lambda\ 4834 + 3\text{W}.$$

On other days, when the light of the portion of the sky near the zone of maximum polarisation the dominant wave length was found to be between these two limits, and was never found bluer, and the smallest admixture of white light was found to be 1·9.

From these measures it may be concluded that the dominant colour of a blue sky is λ 4800.

Amongst artists it is not uncommon to employ cobalt to render this colour, and in many instances this is mixed with Chinese white.

The dominant colour of cobalt was found to be at scale No. 29, or λ 4812, when illuminated by ordinary day light, whence it seems that, as far as colour is concerned, it is singularly fit for the purpose.

Sun light was compared in the same manner, but the beam

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